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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,141	12/11/2003	Veera Palanivelu Rajendran	133428	7377

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EXAMINER	
GONZALEZ, MADELINE	

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/733,141	RAJENDRAN ET AL.	
	Examiner	Art Unit	
	Madeline Gonzalez	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/11/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-4 and 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arz et al. (U.S. 6,636,041) [hereinafter Arz].

Arz discloses a method for monitoring deformations in at least one location of an electromagnetic coil assembly 21, as shown in Fig. 2, the electromagnetic coil assembly having at least one electrical winding, the method including the steps of:

- passing a light through a non-magnetic optical fiber LF10 inserted in a non-magnetic sheath wound and cast with the electrical winding, the optical fiber LF10 having a core containing at least a first Bragg grating BG11 etched therein;
- detecting a wavelength of light reflected from the first Bragg grating BG11;
- determining a deformation of the electromagnetic coil assembly at a location of the first Bragg grating BG11 utilizing the detected wavelength of the light reflected from the first Bragg grating BG11;
- wherein said passing a light through an optical fiber LF10 comprises passing light from a laser 54 through the optical fiber LF10;
- wherein the core of the optical fiber LF10 has a plurality of Bragg gratings BG11, BG12, etched therein at different lengths along the fiber LF10, and wherein the Bragg gratings BG11, BG12, in the wound optical fiber LF10 are disposed at different locations in the electromagnetic coil assembly 21;
- detecting a wavelength of light reflected from at least a second Bragg grating BG12 at a location spaced apart from the location of the first Bragg grating BG11;
- determining a deformation of the electromagnetic coil assembly 21 at least at a location of the second Bragg grating BG12 utilizing the detected wavelength of the light of the reflected from the second Bragg grating BG12;
- wherein passing a light through an optical fiber LF10 comprises passing light from a variable frequency laser 54 through the optical fiber LF10;
- distinguishing reflected light from the at least a second Bragg grating BG12 from reflected light from the first Bragg grating BG11 (see column 5, lines 30-40);

- wherein light reflected from a plurality of Bragg gratings BG11, BG12, is used to monitor deformations at a plurality of locations in the electromagnetic coil assembly 21;
- wherein the electromagnetic coil assembly 21 is in an electric machine, as shown in Fig. 1;
- wherein the electromagnetic coil assembly 21 is in a magnetic resonance imaging system, as shown in Fig. 1; and
- passing a current through an electrical winding of the electromagnetic coil assembly 21 (see column 4, lines 3-6).

Arz lacks the step of determining a temperature of the electromagnetic coil assembly at a location of the Bragg gratings, and cooling the electromagnetic coil assembly in accordance with the determined temperatures.

With respect to the step of determining a temperature of the electromagnetic coil assembly at a location of the Bragg gratings and cooling the electromagnetic coil assembly in accordance with the determined temperatures: Arz discloses in its description of the Prior Art that fiber Bragg gratings can be used as a sensor for acquiring temperature changes, since the Bragg gratings depend on temperature, which leads to a modification of grid spacings of the Bragg grating and thus to a characteristic change of the wavelength of the light reflected by the Bragg grating (see column 2, lines 32-41). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use the Bragg gratings

disclosed by Arz in Fig. 2, to measure the temperature changes of the coil assembly 21, in order to monitor deformations related to temperature changes. Furthermore, it would have been obvious to cooled the coil assembly in accordance with the determined temperatures in order to keep the coil assembly at a desired temperature to avoid deformations due to temperature changes.

4. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arz (U.S. 6,636,041) in view of Grosswig et al. (U.S. 6,547,435) [hereinafter Grosswig].

Arz discloses all the subject matter claimed above in paragraph 3 with the exception of the specific methods for distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating.

With respect to the specific methods for distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating: Grosswig teaches the used of intensity based reflectometry such as optical frequency domain reflectometry and optical time domain reflectometry in order to measure locally resolved detection of temperature measurements (see column 1 lines 55-67). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use intensity based reflectometry such as optical frequency domain reflectometry and optical time domain reflectometry as taught by Grosswig in the method disclosed by Arz in order to measure locally

resolved detection of temperature measurements and distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating.

5. Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arz (U.S. 6,636,041).

Arz discloses an electromagnetic coil assembly kit having:

- an electrically conducting electromagnetic winding and a non-magnetic sheath wound and cast therein;
- a non-magnetic fiber optic fiber LF10 configured for insertion in the sheath and having distributed therein a plurality of Bragg gratings BG11, BG12, each configured to reflect light indicative of deformation at a location of the Bragg gratings in the electromagnetic coil assembly 21;
- an electric machine including the electromagnetic coil assembly kit, as shown in Fig. 1;
- a magnetic resonance imaging apparatus having the electromagnetic coil assembly kit, wherein said electromagnetic winding is configured as a gradient coil; and
- wherein the fiber optic fiber LF10 in inserted in the sheath.

Arz lacks the Bragg gratings configured to reflect light indicative of temperature at a location of the Bragg gratings.

With respect to the Bragg gratings configured to reflect light indicative of temperature at a location of the Bragg gratings: Arz discloses in its description of the Prior Art that fiber Bragg gratings can be used as a sensor for acquiring temperature changes, since the Bragg gratings depend on temperature, which leads to a modification of grid spacings of the Bragg grating and thus to a characteristic change of the wavelength of the light reflected by the Bragg grating (see column 2, lines 32-41). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use the Bragg gratings disclosed by Arz in Fig. 2, to measure the temperature changes of the coil assembly 21, in order to monitor deformations related to temperature changes.

6. Claims 17-19 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arz (U.S. 6,636,041).

Arz discloses a measuring apparatus, as shown in Fig. 2, having;

- an electromagnetic coil assembly 21 having an electrically conducting electromagnetic winding, a non-magnetic sheath wound and cast therewith, and a non-magnetic fiber optic fiber LF10 inserted in the sheath and in communication with the electromagnetic winding, said fiber optic fiber LF10 having distributed therein a

plurality of Bragg gratings BG11, BG12, each configured to reflect light indicative of a deformation at a location thereof;

- a light source configured to pass light into the fiber optic fiber LF10;
- a reflected light sensor 53 configured to sense light reflected back from the Bragg gratings BG11, BG12;
- a processor 51 responsive to the reflected light to determine deformations utilizing said reflected light;
- wherein said light source is a laser 54;
- wherein said laser 54 is a variable frequency laser; and
- wherein said electromagnetic winding is configure as a gradient coil.

Arz lacks the processor determining the temperature, and the processor configured to at least one of turn off current through the electromagnetic winding, or provide additional coolant or ventilation when a determined temperature exceed a limit.

With respect to the processor determining the temperature, and the processor configured to at least one of turn off current through the electromagnetic winding, or provide additional coolant or ventilation when a determined temperature exceed a limit: Arz discloses in its description of the Prior Art that fiber Bragg gratings can be used as a sensor for acquiring temperature changes, since the Bragg gratings depend on temperature, which leads to a modification of grid spacings of the Bragg grating and thus to a characteristic change of the wavelength of the light reflected by the Bragg grating (see column 2, lines 32-41). Therefore, it

would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a processor using the Bragg gratings disclosed by Arz in Fig. 2, to measure the temperature changes of the coil assembly 21, in order to monitor deformations related to temperature changes. Furthermore, it would have been obvious to provide a step such as turning off current through the electromagnetic winding, or provide additional coolant or ventilation when a determined temperature exceed a limit in order to keep the coil assembly at a desired temperature to avoid deformations due to temperature changes.

7. Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arz (U.S. 6,636,041) in view of Grosswig (U.S. 6,547,435).

Arz discloses all the subject matter claimed above in paragraph 6 with the exception of the specific methods for determining the temperature.

With respect to the specific methods for determining the temperature: Grosswig teaches the used of intensity based reflectometry such as optical frequency domain reflectometry and optical time domain reflectometry in order to measure locally resolved detection of temperature measurements (see column 1 lines 55-67). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use intensity based reflectometry such as optical frequency domain reflectometry and optical coherence domain reflectometry as taught by Grosswig in the method disclosed by Arz in order to measure locally

resolved detection of temperature measurements and distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Twerdochlib discloses a temperature sensing system for stator windings using optical fiber and optical reflectometry such as time domain or frequency domain reflectometry. Carlstrom et al. ('274), Dunphy et al. ('113), Cranch et al. ('441) and Moore disclose systems using optical fiber to measure temperature.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Madeline Gonzalez whose telephone number is (571) 272-2243. The examiner can normally be reached on Monday-Friday (8:00-5:30), alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego F.F. Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MG

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